GEJ-2192C

Supersedes GEJ-2192B

INSTRUCTIONS

TYPE CF-7

HOOK-ON RECORDING VOLT-AMMETER

GENERAL ELECTRIC

EQUIPMENT COVERED

Complete Kits rated 15/30/75/150/300/750 amperes, 150/300/750 volts. Kit consists of Type CF-7 recorder, hook-on transformer, and extension cord as follows:

Cat. No.	Frequency	Chart Speed	Lead Length
684X94	60 cps	3-in. per hr	10 ft
684X98	60 cps	3-in. per hr	50 ft
684X96	60 cps	1-in. per hr	10 ft
685X60	60 cps	1-in. per hr	50 ft
684X95	50 cps	3-in. per hr	10 ft
684X99	50 cps	3-in. per hr	50 ft
684X97	50 cps	1-in. per hr	10 ft
685X61	50 cps	1-in. per hr	50 ft

Type CF-7 recorder only:

Cat. No.	Chart Speed	Frequency
684X90	3-in. per hr	60 cps
684X91	3-in. per hr	50 cps
684X92	1-in. per hr	60 cps
684X93	1-in. per hr	50 cps

Hook-on transformer only:

Cat. No. 8946421

Extension cords only:

Cat. No.	Length
8946433G1	10 ft
8946433G2	50 ft

Note: The transformer and extension cords furnished with the Type CF-7 are identical to, and are interchangeable with the transformer and extension cords furnished with the Type CH-7 recorder.

WARNING

BELOW 5000 VOLTS USE
RUBBER GLOVES
ABOVE 5000 VOLTS USE
HOT-LINE EQUIPMENT
INS. CLASS 8.7 KV
IMP. LEVEL 75 KV FW
CAT. 8946421

The above is a reproduction of the warning notice hat appears on the side of the hook-on transformer.

Before operating, refer to SAFETY PRECAU-TIONS, Pages 13, 14, and 15.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

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* Reg. Trade-mark of the General Electric Co.

TYPE CF-7

HOOK-ON RECORDING VOLT-AMMETER

INTRODUCTION

These instructions cover the use and maintenance of the General Electric recording volt-ammeter (Type CF-7) and hook-on transformer. The combination has been designed to provide a convenient means of recording either current or voltage in a-c circuits. Voltage recordings as high as 750 volts (a-c) can be made by connecting the voltmeter terminals on the recorder directly to the line.

The recorder and hook-on transformer combination permits the recording of current as high as 750 amperes (a-c) on insulated or uninsulated circuits without the usual interruption of service. The hook-on transformer has an ASA insulation rating of 8700 volts a-c.

RECEIVING, HANDLING, AND STORAGE

Immediately on receipt of the Type CF-7 recording volt-ammeter, and hook-on transformer, unpack it with care to avoid unnecessary jarring which may result in injury to the instrument mechanism. Examine the equipment for any damage which may have occurred in transit. If injury or rough handling is evident, a damage claim should be filed immediately with the transportation company, and the nearest

General Electric apparatus sales office should be promptly notified.

The following items are shipped with each recorder and hook-on transformer combination:

Extension cord

Bracket and mounting screws

5 extra record rolls

If the recorder and hook-on transformer are to be stored prior to use, they should be replaced in their original cartons and stored in an area free from excessive vibration or continuous jarring.

DESCRIPTION

The General Electric hook-on recording volt-ammeter combination consists of three basic parts (See Fig. 1.):

The hook-on transformer

The extension cord

The Type CF-7 recording volt-ammeter

HOOK-ON TRANSFORMER

The hook-on transformer is a current transformer which utilizes butyl rubber as insulation. A neoprene-covered cable extends approximately three feet from the handle and is fitted with an automatic shorting connector.

Warning and Caution: The shell of the connector on the short cable attached to the transformer is at the same potential as the recorder case, which,

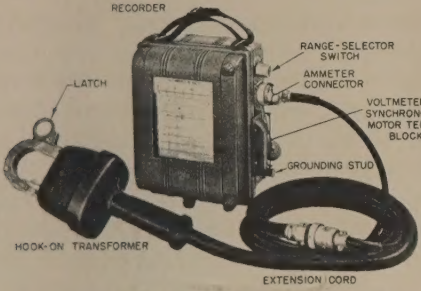


Fig. 1. Type CF-7 recorder and hook-on transformer

in normal use, is grounded. For this reason the connector must be prevented from contacting live circuits. This precaution applies particularly when the transformer is used with the extension cords described in the following section.

The transformer has a friction-grip handle for ease in handling. A self-locking latch on the "hook" allows the transformer to be "hung" on the line in which current recordings are to be made. The latch must be released before the transformer can be removed from the line. The transformer is interchangeable and can be used with any Type CF-7 recorder.

EXTENSION CORD

A 10- and/or 50-foot extension cord may be attached to the cable on the hook-on transformer for connection to the recorder. One of the connectors on each cord (as well as the connector on the short

cable attached to the transformer) is so constructed that whenever the cord is disconnected the secondary side of the current transformer is automatically short-circuited. This prevents a voltage build-up across the secondary leads which would be dangerous to human life.

Warning and Caution: The shells of the connectors on these extension cords are electrically connected to the recorder case, which, in normal use, is grounded. For this reason they must be prevented from contacting live circuits.

RECORDER (See Fig. 1.)

The construction of the Type CF-7 strip-chart recorder makes it adaptable for outdoor service with no additional protection. Entrance of dirt and moisture between the cover and case is prevented by a special rubber gasket which forms an effective seal when the cover screws are tightened. A drip-proof guard mounted over a cork-composition gasket protects the voltmeter leads and the leads to the synchronous-motor terminals. For indoor service this guard need not be attached. A weather-proof connector is used for connection of the hook-on transformer to the recorder. The recorder is interchangeable with any hook-on transformer or extension cable.

Because no ink is used in this recorder, the operating temperature range is limited only by the operating characteristics of the synchronous motors. Re-

fer to the section covering SERVICING OF SYNCHRONOUS MOTORS.

The recorder can be supplied with either a one- or three-inch-per-hour rate-gear unit. The synchronous-motor circuits are rated at 120/240 volts; either 50- or 60-cycle motors can be supplied. (See page 2.)

A friction roller and friction drum (driven by one of the synchronous motors) drive the chart.

A "foldout" is located on page 29 for location of the parts identified below.

A recording is made on the chart by a platen (7, Fig. 12, page 29), pointer (1), and striker bar (2). The actual recording is a series of dots, which, when close together appear to be a continuous line. The tapping of the pointer is controlled by a cam (21) operating in conjunction with a coil spring (19) and a flat-leaf spring (20). When the cam is turning at its correct speed, the inertia of the moving parts will cause the striker bar (2) to overtravel against the spring (19) and tap the pointer (1). During normal operation of the recorder, the automatic-stop lever (4) prevents the pointer from striking the ribbon after the end of the chart leaves the marking area.

The recorder utilizes a permanent-magnet, moving-coil, rectifier-type microammeter which has been adapted to the measurement of either a-c voltage or current. A zero-adjustment lever (10) is provided on the front of the chart carriage for mechanically setting the pointer on zero.

A selector switch is provided on the right-hand side of the case for the selection of ammeter and voltmeter ranges. The switch should be in the OFF position when the recorder is not in use. (See Table 1, Page 22.)

An internal lamp casts a shadow of the pointer on the chart so that it is not necessary to wait until the record shows below the scale plate to make sure the recorder is operating satisfactorily. The radial lines beneath the horizontal line on the scale plate may be used as guides in projecting the shadow of the pointer to the approximate scale reading.

A grounding stud is provided on the outside of the recorder case for grounding the entire recording and measuring system. This stud must be connected to a good "earth" ground whenever a recording is being made.

The special bracket supplied with the recorder may be attached to the bottom of the case so the recorder may be mounted (or hung) on a pole without swaying.

PRELIMINARY OPERATION

Prior to operating, remove the adhesive tape which holds the reroll bobbin and retaining springs in place, and insert a chart by following the instructions given below. Also, adjust the chart to the correct time setting as given under TIME SETTING.

The recorder, as received, will have the typewriter ribbon and spools in their proper places.

INSTALLATION OF CHART (See Fig. 12.)

1. Check to be sure that the selector switch is in the **OFF** position.
2. Loosen the two retaining screws on the front cover and open the recorder case.
3. Check to see that the pointer (1) is on zero; if not, adjust it by means of the zero-adjustment lever (10).
4. Tilt the scale plate (6) forward so that it is at right angles to the chart carriage.
5. Pull the typewriter ribbon (15) forward so that there is approximately two inches of slack.
6. Place the supply roll (22) between its two pivots at the top of the chart carriage. The supply roll should rotate in a counterclockwise direction as viewed from the right-hand side of the recorder case.
7. Unroll approximately 12 inches of chart and pass the end of the chart under the scale plate (6) and ribbon (15).
8. Take up the slack in the typewriter ribbon by rotating the left-hand ribbon spool on the top of the chart carriage. Care should be taken to see that the ribbon is in its guides (3).
9. Return the scale plate (6) to its vertical position (against the chart carriage).
10. Lift the reroll springs (12) and remove the reroll bobbin (11).
11. Insert the chart between the timing drum (23)

and guide (24), and push it until it appears at the bottom of the case.

12. Check the automatic-stop lever (4) and see that it is flush and parallel with the front plate (5).

13. Replace the reroll bobbin in the slots, with the paper under the reroll bobbin, and lower the reroll springs.

14. Wind the end of the chart around the reroll bobbin in a counterclockwise direction as viewed from the right-hand side of the case.

15. Take up the slack of the chart so that it hugs the timing drum. This is accomplished by means of the large knurled knob (14) on the reroll bobbin.

TIME SETTING

The correct time setting on the chart is one inch below the top edge of the scale plate. Since it is not convenient to set the chart to the correct time by referring to the point at which the recording is made, it is suggested that the correct time be set by means of the top edge of the scale plate. One inch on a three-inch-per-hour chart is 20 minutes; on a one-inch-per-hour chart, it is 60 minutes.

Example:

On a one-inch-per-hour chart, to set the chart to 3 p.m., advance the chart so that it reads 4 p.m. at the top edge of the scale plate; or, with a three-inch-per-hour chart, you would set the chart so that it will be 3:20 p.m. at the top edge of the scale plate.

To set the chart, turn the large knurled knob (14, Fig. 12) on the right-hand side of the reroll bobbin in a counterclockwise direction while advancing the supply roll (22) with the other hand. Care should be taken not to pass the required setting.

As a further check of the correct time setting, tilt the scale plate forward, lift the typewriter ribbon, and note the position of the chart in relation to the index mark on the ribbon guides (3). This index mark is located opposite the point at which the "dotting" (recording) takes place.

After installing a chart, and setting the chart to the correct time, the recorder is ready to be connected to the line by means of the voltmeter leads for voltage measurements or by means of the hook-on transformer for current measurements. (Refer to the section covering CONNECTIONS.)

SAFETY PRECAUTIONS

It is suggested that the following safety precautions be followed so as to prevent damage to equipment or injury to personnel while handling the transformer or recorder.

1. **WARNING** — On circuits **BELOW 5,000 VOLTS USE RUBBER GLOVES** when handling the transformer; on circuits **ABOVE 5,000 VOLTS USE HOT-LINE EQUIPMENT.**

2. It is suggested that a nylon cord, approximately 15 inches long, be attached to the latch ring on the

SAFETY PRECAUTIONS (con't)

transformer to aid in disconnecting it from the conductor, but it should be used only on low-voltage circuits. (See SAFETY PRECAUTIONS No. 1.)

3. Do not make any changes in connections or in the synchronous-motor links while there is power on the line.

4. If your recorder model number is 8CF7BAA1, -2, -3, or -4 (only) the hook-on transformer must be disconnected from the recorder while a voltage recording is being made.

5. Always have the range-selector switch in the **OFF** position when changing connections to the recorder.

6. Note that when releasing the transformer from a conductor, only a VERY SLIGHT downward pressure is required to release the automatic-latch lever on the hook.

7. It is recommended that the range-selector switch on the recorder be set to the highest range when starting a recording. Then, if more deflection of the recorder pointer is desired, set the range-selector switch. This will prevent damage to the recorder mechanism from overloading.

8. Remember that the hook-on transformer is at the same potential as the conductor to which it is attached except on insulated conductors which have an insulation rating equivalent to or greater than the voltage on the conductor.

9. When making current recordings, connect the grounding stud on the right-hand side of the recorder case to a good "earth" ground. Use No. 12 Awg. or heavier copper wire. Remember that grounding the recorder case also grounds the shell of the connector on the short cable attached to the transformer (as well as the shells of the connectors on the extension cords). For this reason the connector shells must be prevented from contacting live circuits.

CONNECTIONS

AMMETER (See Fig. 2-4.)

Current measurements are made by means of the recorder and hook-on transformer. The recommended installation and connection procedure is as follows:

1. Locate the recorder where it is to remain during the measurement period.

2. Connect the grounding stud on the right-hand side of the recorder case to a good "earth" ground. Use No. 12 Awg. or heavier copper wire.

3. Connect the lead from the transformer to the mating connector on the right-hand side of the recorder case. Tighten the coupling ring.

4 Open the transformer hook by releasing its latch (See Fig. 1.) and snapping it open.

5. Attach the hot-line pole (if required) to the transformer. See note on following page and Fig. 2-4, also SAFETY PRECAUTIONS No. 1.

Fig. 2. Place hook around conductor and push handle.

Note: For operation above 5000 volts, the following procedure and hot-line equipment (or equivalent) is recommended for attaching or disconnecting the transformer from the conductor:

Fuse Puller, A. B. Chance Cat. No. M-4455-78

Universal Hot-line Pole, 8-ft length, A. B. Chance Cat. No. M-1760.

Remember that the hook on the current transformer is at the same potential as the line to which the transformer is connected.

Warning and Caution: Remember that the shell of the connector on the short cable attached to the transformer (as well as the shells of the connectors on the extension cords) are grounded. For this reason they must be prevented from contacting live circuits. (See Step 8.)

6. Place the hook around the conductor (See Fig. 2.) and press the hook against the conductor. The automatic-latch lever will lock the transformer hook so that the transformer may be hung on the conductor.

Fig 3. Turn extension-pole counterclockwise to remove it.

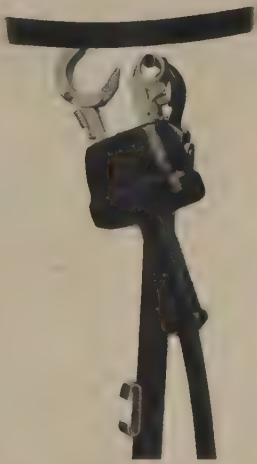


Fig. 4. Insert hook in latch to release.

7. Remove the hot-line pole (or fuse puller) from the transformer. (See Fig. 3.) The transformer is then in position for use.

8. Prevent the shell of the connector on the short cable attached to the transformer (as well as the shells of the connectors on the extension cords) from contacting live circuits, either by shielding them or by fastening them against sway, or otherwise protecting them against contact.

9. Connect the synchronous motors as described

in the section covering TELECHRON SYNCHRONOUS MOTORS.

10. Check to see that the chart is set to the correct time.

After the recording has been made, proceed as follows:

11. Insert the hot-line-pole (or fuse puller) hook into the eyelet of the latch on the hook-on transformer and exert a *slight* pressure downward. The hook will then open and the transformer will be supported by the hot-line pole. It can then be lowered to a point safely away from the high voltage. (See SAFETY PRECAUTIONS, No. 1, 2, and 6.)

VOLTMETER (See Fig. 5-6.)

The hook-on transformer and extension cord(s) must be disconnected from the recorder when making voltage measurements. Connections are made to the

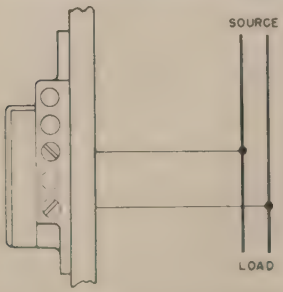


Fig. 5. Voltmeter connections

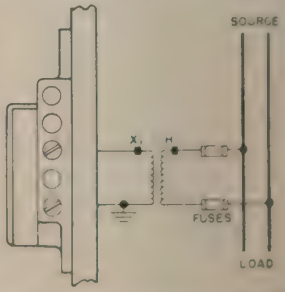


Fig. 6. Voltmeter connections with potential transformer

terminal block on the right-hand side of the recorder case.

To make the connections, loosen the four clamping screws on the cover over the terminal block and slide the cover up and off. The terminal screws are reached by opening the recorder cover.

Connect the leads to the two lower terminals and make connections to the synchronous motors as given below.

Check to see that the chart is set to the correct time before operating.

It is not necessary to replace the terminal-block cover for *indoor* operation of the recorder.

If the value of voltage being recorded is not known, set the range-selector switch on the highest range. If greater deflection is desired, set the switch to one of the lower ranges.

When using a potential transformer, the secondary side of the transformer should be grounded with No. 12 Awg. or heavier copper wire.

TELECHRON SYNCHRONOUS MOTORS (See Fig. 7-9.)

The synchronous-timing-motor circuit is independent of the measuring circuit, and connections to it must be made externally.

External connections to the synchronous motors are made to the two top terminals on the terminal block

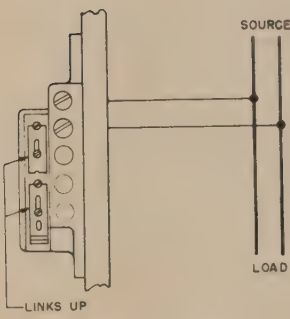


Fig. 7. Timing motor connections for 120-volt source

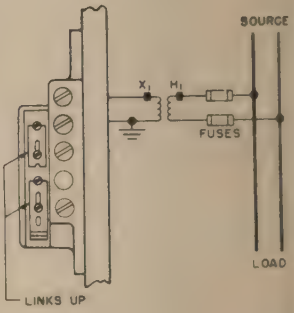


Fig. 8. Timing motor connections with potential transformer

(See Fig. 7-9.). To make the connections, loosen the four clamping screws on the guard over the terminal block and slide the guard up and off. The terminal screws are reached by opening the recorder cover. It is not necessary to replace the terminal-block cover for *indoor* operation.

In most applications, it has been found convenient to use the line whose voltage or current is being recorded as a power supply for the synchronous motors. The synchronous motors used in the Type CF-7 recorder have two voltage ratings. Refer to the nameplate on the recorder.

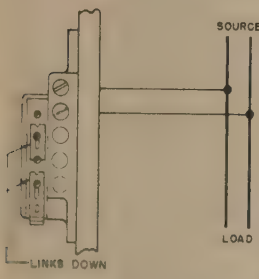


Fig. 9. Timing motor connections for 240-volt source

Adjustment of the motors for either the high- or the low-voltage rating can be accomplished by means of the links on the terminal block on the inside at the right-hand side of the case. When using the high-voltage rating the two links should be in the "down" position; and, when using the low-voltage rating, the links should be in the "up" position.

OPERATION

After installing a chart, setting the chart to the correct time, locating the pointer on zero, and making the proper connections, the operation of the recorder is automatic.

READING CHART

The chart is marked from 0-15; therefore, in order to obtain a correct reading rather than merely an indication (except in the case of the 0-15 ampere scale) it will be necessary to multiply the indication on the chart by one of the multiplication constants given in the following table.

TABLE I

	Scale Used	Multiplication Constant
Voltmeter ranges	0-150	10
	0-300	20
	0-750	50
Ammeter ranges	0-15	1
	0-30	2
	0-75	5
	0-150	10
	0-300	20
	0-750	50

REMOVING CHART (See Fig. 12.)

To remove the chart from the reroll bobbin, proceed as follows:

1. Advance the chart so that all of the record is on the reroll bobbin.
2. Lift the reroll springs (12) until they catch on the lugs (13).
3. Lift the reroll bobbin (11) and chart out of its slots. It will be necessary to advance the chart slightly by advancing the supply roll.
4. Cut the chart just behind the reroll bobbin.
5. Hold the bobbin loosely in the left hand and turn the knurled knob on the reroll bobbin in a clockwise direction with the right hand, at the same time pulling the bobbin out of the reroll chart. Several

turns of the bobbin should free it from the chart.

6. It is recommended that the setting of the range-selector switch, the date, and other pertinent information, such as location, be marked on the chart immediately after removing the chart from the reroll bobbin.

7. Reload the reroll bobbin as described in the section covering INSTALLATION OF CHART, steps 13-15.

REPLACING RIBBON

The ribbon requires no attention for one month's operating time regardless of the chart speed. In other words, it will last for four three-inch-per-hour charts or one one-inch-per-hour chart.

After this period, the ribbon should be reversed by exchanging spools. Place the empty spool on the ratchet side and the full spool on the right-hand side. This makes use of the opposite edge of the ribbon. Be sure to replace the retaining springs over the spools.

The ribbon can be used several times by means of this procedure until it is worn out or the record is too faint. A medium-inked Underwood ribbon (or equivalent) may be used provided it is modified by attaching it to the spool with a short length of cellulose tape instead of having the ribbon attached to the hook on the spool. A specially inked ribbon suitable for cold-weather operation is furnished with the instrument.

CHANGING CHART SPEED

A change in chart speed may be effected by replacing the rate-gear unit located on the left-hand side of the chart carriage (front view). This is accomplished by removing the single screw which fastens the unit to the chart carriage and pulling the unit forward. When inserting a rate-gear unit, the side on which the speed is stamped should be on the outside. Care should be taken that the locating groove at the back of the unit engages the shoulder stud in the chart-carriage plate.

Rate-gear units may be obtained for one or three inches per hour. Charts have sufficient length to last the following periods of time:

Chart Speed	Chart Will Last
1 in. per hr.	31 days
3 in. per hr.	8 days

MAINTENANCE

TRANSFORMER

Cleaning

Keep the jaws and body of the hook-on transformer clean by wiping them with a cloth dampened with silicone oil. Waxing the hook laminations will preserve their finish.

RECORDER

Cleaning

If for any reason the pointer clings to the striker bar on its backward stroke, it should be cleaned with a small camel-hair brush and alcohol. Care should be taken not to allow the pointer to come in contact with the typewriter ribbon at any time.

Replacing Indicator Lamp

To replace the indicating lamp remove the supply roll (22, Fig. 12), swing the lamp bracket 90 degrees (to a vertical position) and change the lamp. A G-E No. 43 lamp should be used as a replacement.

Lubrication

In general, gears and gear-train pivots should be oiled at least once every six months with SAE-30 oil. A trace of oil applied with a wire to each pivot is sufficient. Oil the bearings and the timing drum, reroll bobbin, and eccentric gear which operates the ribbon drive; also apply ball-bearing grease to the teeth of the eccentric gear and to the teeth of the ratchet on the reroll spool of the typewriter ribbon. The surface of the striker cam should be kept clean and well lubricated.

DO NOT OIL AUTOMATIC-STOP LEVER.

A little petrolatum or grease on the cover-locking screws will prevent any tendency to stick and will facilitate sealing.

Servicing Of Synchronous Motors

The Telechron Motors are equipped with sealed-greased rotors which require no maintenance. The operating temperature range of these units is −30F to +150F.

(Prior to June 1955 the motors were equipped with oil-filled rotors. With these units the operating temperature range depends on the Class of oil used. For Class HR oil the range is +5F to +150F; for Class LU oil the range is −30F to +100F. Class HR oil was furnished unless otherwise specified.)

The minimum temperatures indicated above are those at which motors in good operating condition will start and run synchronously after power interruption. In most applications the motors will continue to run at temperatures somewhat below these values if there is no power interruption. Motors will safely withstand, for short periods, temperatures somewhat higher than the maximum temperatures indicated. It is recommended that no motor be operated continuously at the maximum values. Operation under such conditions and operation under frequent excessive temperature fluctuation will limit the life of the rotor.

If a synchronous motor operates improperly, it may be necessary to replace the rotor. To remove

the synchronous motors, or their rotors, proceed as follows:

1. Remove the selector-switch assembly, chart carriage, and terminal block from the case. The chart-and-ribbon drive motor is located on the left-hand side plate while the striker motor is located on the right. Each motor is fastened to its side plate by two screws. These screws may be reached from the outside of either side plate without removing any other parts. The ratchet arm operating the typewriter ribbon may be rotated out of the way.

2. Remove the pinion on the chart-and-ribbon drive motor and the cam from the striker motor by loosening the set screws. The motors can now be taken out. If the motor leads are disconnected, they should be properly tagged for resoldering.

3. Withdraw the rotor from the laminations.

Note: In reassembling the new rotor, the word "top" should be located so that it will be at the top when the motor is assembled in the chart carriage.

Adjustment Of Striker Assembly (See Fig. 12.)

For proper operation of the striker assembly it is important that all component parts be properly adjusted and that the striker bar and platen be properly aligned. The detailed procedure is given on page 28.

The platen (7) should be adjusted so that it is absolutely parallel to the striker bar (2) in both the

horizontal and vertical planes. Its adjustment with respect to the striker bar is obtained by means of two eccentric cams (16) against which the entire scale plate assembly, including the platen, rests. The cams are located on the side plates and are locked in position by the shoulder screws (17). The alignment of the platen vertically, or at right angles to the former adjustment, can be changed by loosening the four small screws (8) which fasten the scale-plate support to the hinge arms. The platen should clear the surface of the ribbon guides (3) by 1/32-inch in order to provide free movement of the ribbon.

In order for the recording to take place satisfactorily, a clearance of 5/32-inch should exist between the striker bar and platen when the cam is at its maximum displacement position, and 3/64-inch at its minimum displacement position. The marking end of the pointer should be parallel to the chart surface and should travel in a plane just clearing the back surface of the ribbon guides (3).

If it becomes necessary to make any of the preceding adjustments, the following procedure for obtaining the proper clearances is suggested.

1. Check the angle between the rectangular hub (25), and the top surface of the side plate. This angle should be 30 degrees when the striker bar is held against the platen. Adjust, if necessary, after loosening the set screws (9).

2. Adjust the 5/32-inch and 3/64-inch striker-

bar-to-platen clearance by means of the adjusting screw (18). Advancing the screw increases these clearances. Tighten the lock-nut after the proper setting has been made. To facilitate measurement of the 5/32-inch and 3/64-inch clearances, the chart-guide bar (26) may be removed. With experience, the proper setting of the screw (18) can be made with motors operating and the chart in place by watching the record obtained while the chart is advanced by hand.

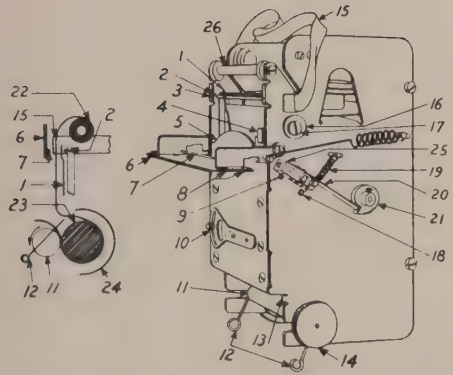
If the pointer is not located in the correct plane as described above, bend it carefully at the last sharp bend by means of tweezers, taking extreme care not to use any undue force which may be transmitted to the pivots or the jewels.

SERVICING

If you need to repair, recondition, or rebuild any electric apparatus, a G-E service shop near you is available day and night, seven days a week, for work in the shops or on your premises. Latest factory methods and genuine G-E renewal parts are used to maintain the original performance of your G-E equipment. For full information about these services, contact the nearest service shop or sales office.

Record rolls (packed 5 per box) and typewriter ribbon should be ordered from the nearest General Electric apparatus sales office. Specify as follows:

Record Roll: Number 303A-1 (1-in. per hr)
Record Roll: Number 303A-3 (3-in. per hr)
Typewriter Ribbon: Catalog Number 4141571P2



1. Pointer
2. Striker bar
3. Ribbon guide
4. Automatic-stop lever
5. Front plate
6. Scale plate
7. Platen
8. Scale-plate holding screws
9. Hub set screw
10. Lever arm (zero adjustment)
11. Reroll bobbin
12. Reroll springs
13. Reroll-spring holding lugs
14. Reroll-bobbin knob
15. Typewriter ribbon
16. Eccentric cam
17. Shoulder screw (for eccentric cam)
18. Clearance-adjustment screw (between striker bar and platen)
19. Coil spring
20. Leaf spring
21. Tapping cam
22. Supply roll
23. Timing drum
24. Chart guide
25. Hub
26. Chart-guide bar

Fig. 12. Diagrammatic view of chart-and-marking mechanism

Fig. 12. Diagrammatic view of chart-and-marking mechanism (over)

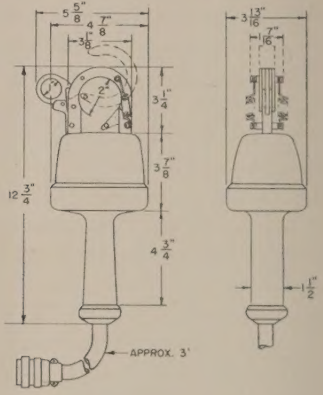


Fig. 10. Outline dimensions, hook-on transformer

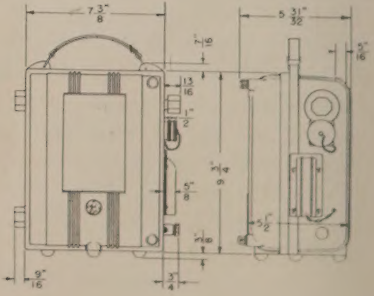


Fig. 11. Outline dimensions, Type CF-7 recorder

OTHER GENERAL ELECTRIC HOOK-ON INSTRUMENTS

VOLT-AMMETER

Type AK-4 or Type AK-5 instruments provide a means of measuring either current or voltage in a-c circuits. Measurements may be made on either insulated or uninsulated circuits. Refer to Bulletin GEC-901.

WATT-VARMETER

The Type AK-2 instrument provides a means of measuring a-c power (watts) quickly and easily on insulated or uninsulated circuits. It is also possible to measure vars in balanced three-phase circuits. Refer to Bulletin GEC-901.

POWER-FACTOR METER

The Type AK-3 instrument provides a means of measuring power factor directly on any insulated, or uninsulated, balanced three-phase a-c circuit. Refer to Bulletin GEC-901.

OTHER GENERAL ELECTRIC RECORDING INSTRUMENTS

TYPE CF-1 (AC) and TYPE CF-2 (DC)

These portable, inkless, strip-chart, recording instruments are suitable for either indoor or outdoor service. They are useful in conducting voltage surveys, complaint investigations or checking circuit loads. A-c recorders are available as voltmeters, ammeters, or single-phase wattmeters. D-c recorders are available as microammeters, ammeters, or voltmeters. Recorders are also available with switchboard cases, Type CF-4 (a-c) and Type CF-5 (d-c). Refer to Bulletin GEC-215.

TYPE CH

These portable or switchboard, a-c or d-c, strip-chart recorders with throw-away inkwell can be supplied with a wide range of chart speeds. Models are available to measure current, voltage, single-or polyphase watts, vars, frequency and speed. These recorders feature high accuracy, reliablity, and versatility. Refer to Bulletin GEC-1319.

* * * *

For further information, or copies of the above bulletins, contact the nearest General Electric apparatus sales representative.

INSTRUMENT DEPARTMENT

GENER

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